



# The HOLLAND TUNNEL

“The Underground Highway  
which Joins a Continent to a City”

## FOREWORD



**A**PPROXIMATELY fifteen million motorists from all parts of the country will enter New York City through its new gateway, The Holland Tunnel, during the coming twelve months.

On opening day alone 51,748 cars passed through the twin tubes.

To acquaint the motorists of America with the facilities offered by this "eighth wonder of the world," this booklet of information has been prepared.

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# TUNNEL FACTS

THE Holland Tunnel is the longest vehicular tunnel in the world. It consists of twin tubes, each having a total length of 9,250 feet. The distance between its portals is 8,463 feet and between river shafts, 3,374 feet. The portion of the tunnel below the river measures 5,480 feet.

## *Location*

The New York entrance plaza is between Hudson, Varick, Broome and Watts Streets, in New York City, while the New Jersey entrance is at Twelfth and Provost Streets, Jersey City. In New York, the exit is at Canal and Varick Streets. The Jersey City exit is at Fourteenth and Provost Streets.

The separation of the exits and entrances is planned to prevent undue congestion at the tunnel terminals. The tunnel entrances are reached by all leading highways.

The tunnel is seventy-two feet below mean high water and the maximum depth of the roadway below mean high water is ninety-three feet. The minimum cover afforded the top of the tunnel by the bed of the Hudson River is sixteen feet. The tunnel is lined with 115,000 tons of cast iron and 130,000 cubic yards of concrete. Headroom in the tunnel is thirteen feet six inches.

## *Dimensions and Construction Data*

The tunnel has two roadways, one in the north tunnel and one in the south tunnel. These roadways are twenty feet wide and accommodate two lines of traffic. The maximum up-grade of the roadways is 3.8 per cent and the maximum down-grade 4.06 per cent. The surface of the roadways is of granite block. The curbing also is of granite.

## *Capacity*

More than 1,900 motor vehicles per hour can pass through each tube. The estimated daily tunnel traffic is 46,000 vehicles. Figures for the yearly traffic are estimated at 15,000,000 vehicles.

## *Ventilation*

The method of ventilating the Holland Tunnel is transverse distribution. Air is supplied and removed continuously throughout the length of the tunnel. There is no longitudinal movement of air. The ventilation system provides for changing the air forty-two times per hour. The total amount of air supplied to the tunnel per minute is 3,761,000 cubic feet.

Carbon monoxide discharged by motor vehicles passing through the tunnel is limited to less than four parts in 10,000 parts of air. The vitiated air is drawn from the tunnel through vents in the ceiling by means of fans. Fresh air is forced into the tunnel by

other fans through slits in the walls near the flooring.

Beneath the roadway, a fifty-eight-mile-an-hour blast of fresh air rushes through a long duct. From this duct branches lead to expansion boxes, extending along the curbing. The ventilating blasts expend their fury in the expansion boxes, and from the expansion boxes air issues forth like a gentle breeze.

In the roof of each of the two tubes of the tunnel there is another duct into which vitiated air rises through openings. Exhaust fans suck out this air.

The fans are housed in ventilation buildings, each as high as an ordinary ten-story building. There are two of these buildings on the New York side and two on the New Jersey side. There are eighty-four fans, forty-two blowers and forty-two exhausters. One-third of these fans are held in reserve as a precaution.

The motive power for the fans is electricity, with an installation of 6,000 horsepower. There are three electric cables from the New York side and three from the New Jersey side. Any one of the six independent cables has a capacity sufficient to operate the entire ventilation system.

Electric indicator lamps register the speed of all fans. Other indicators show the content of carbon monoxide in every section of the tunnel. The entire working of the ventilation system is under constant observation of skilled operators in the control rooms. Although each fan has its own switch, the current may be turned on or off from the main control room.

## *Safety Devices*

Throughout the tunnel signs indicate emergency exits, leading from one tube to the adjacent tube as well as to the surface at the shafts. Along the tunnel walls at convenient intervals are niches to accommodate fire fighting apparatus. The apparatus includes foam extinguishers, hose for flushing and fire purposes, valves connected with the six-inch water main traversing each tunnel, sand bins, fire alarms and telephones. An emergency fire fighting and rescue truck with double-end control is housed at each tunnel exit ready to salvage any disabled vehicle.

## *Policing*

Police are stationed at intervals of 480 feet on a walk raised above the level of the roadway in each tube. Each policeman has access to a telephone by means of which he can communicate to the administrative building any unusual occurrence in the tunnel. More police are stationed at the tunnel entrances and exits to direct traffic to lanes of approach and exit. The police are specially trained men independent from the City Police Departments of New York and Jersey City.

# New York State Bridge



GEORGE R. DYER,  
*Chairman*

General George R. Dyer, Chairman of the New York State Bridge and Tunnel Commission, has served the City and State of New York on numerous occasions. He has been active in military circles for many years, having served as Captain and Major in the Spanish-American War, and as a Brigadier-General on the Mexican border in 1916. During the World War he was placed in command of the entire military forces of the State. His association with the New York State Bridge and Tunnel Commission dates back to 1907. He was appointed chairman in 1913. He is the son of the late Governor Elisha Dyer, of Rhode Island, and is a direct descendant of Roger Williams.

Mr. Shamberg's interest in the project of constructing a vehicular crossing between New York and Jersey City led to the introduction of the initial legislation, creating the bridge and tunnel commission in New York in 1906. He was appointed by Governor Higgins as a charter member of that commission, and has been serving continuously, as a member of the commission, since that time. He is head of the exporting firm of J. Shamberg & Son.



A. J. SHAMBERG

In addition to his work with the New York State Bridge and Tunnel Commission, Colonel Greene has served on the Canal Board, the Water Power and Control Commission, and the Board of Commissioners of the Land Office, State Office Site and Building Commission. He also has been Commissioner of Highways for the State of New York from 1919 to 1921, and Superintendent of Public Works of the State of New York from 1923 to date. During the World War, Commissioner Greene served with the 302nd Regiment of Engineers, 77th Division.



FREDERICK S. GREENE  
*Superintendent of Public Works*

# and Tunnel Commission

Vice-chairman and one of the veteran members of the New York State Bridge and Tunnel Commission, Mr. Bloomingdale was appointed to that body in 1906. Although active in the business world for more than fifty years, he has given generously of his time to public service. He was a Presidential elector in 1900, is a trustee of the McKinley National Memorial Association and treasurer of the Election Laws Improvement Association. Mr. Bloomingdale also has served as a member of Hudson Ter-Centenary Commission, Committee of 70, and is president of the Board of Managers of The Society of Reformation of Juvenile Delinquents conducting the House of Refuge, New York City.



E. W. BLOOMINGDALE,  
*Vice-Chairman*



MCDUGALL HAWKES

Active in international law circles and a member of many foreign civic societies in this country, Mr. Hawkes has served as a member of the New York Bridge and Tunnel Commission since 1906. He founded the French Institute in the United States in 1911 and is Chairman of the Board of Trustees of the Museum of French Art, French-American Chamber of Commerce, French Union and other French organizations here. He holds many foreign decorations and is a member of numerous patriotic societies. He served as Commissioner of Docks from 1902 to 1903, and was responsible for much Hudson River waterfront improvement work.



ALBERT GOLDMAN  
*Commissioner of Plant and Structures*

In addition to his work as a member ex-officio of the New York Bridge and Tunnel Commission, Mr. Goldman also is Commissioner of Plant & Structures of New York City. He holds office in many charitable, fraternal and patriotic organizations. For twenty-four years he was assistant general commercial manager in the Bronx District of the New York Edison Company as well as being a director of the Bronx Borough Bank, former president of the Bronx Board of Trade, of the New York Electrical League, of the New York Section of the National Electric Light Association and chairman of the Bronx Division of the federation for the support of Jewish philanthropic societies.

# New Jersey Interstate Bridge



WELLER H. NOYES

Mr. Noyes was appointed a member of the New Jersey Interstate Bridge and Tunnel Commission in 1910, in recognition of previous services rendered to the tunnel construction enterprise. He served as chairman of the commission from 1913 to 1921. For many years he was associated with Swift & Company, being vice-president of the New York Corporation. He was president of the New Jersey State Chamber of Commerce and for many years a trustee of that body. He is president of the Tenaflly Trust Company, having held this office for 19 years. Since 1925 he has devoted his entire time to administration work of tunnel and bridge construction.



THEODORE BOETTGER,  
*Chairman*

Theodore Boettger, Chairman of the New Jersey Interstate Bridge and Tunnel Commission, has been quietly active in public life for many years. He served ably in both the Red Cross and Liberty Loan Campaigns during the World War, and at the close of the war was prevailed upon to become a member of the Tunnel Commission. He has been Chairman of the New Jersey Commission since 1922. Head of the biggest dyeing company in the country, his experience as an executive made him the unanimous choice of his fellow members for the Chairmanship during the most critical years of the tunnel's construction. He is active in philanthropic work and is a member of many of the leading clubs in New Jersey and New York.



JOHN F. BOYLE

Prominent in public life of Jersey City, Mr. Boyle resigned from the board of managers of the New Jersey State Hospital in 1920 to become a member of the New Jersey Interstate Bridge and Tunnel Commission. Besides his work as a member of the commission, he is treasurer of the Hudson County Sinking Fund and of the City Pension Fund, director of the Commercial Trust Company of New Jersey and of the New Jersey Fire Alarm Company.

Appointed to the New Jersey Interstate Bridge and Tunnel Commission in 1922, Mr. Sinclair has been active in public life for many years. A member of the Essex County Park Commission since 1905, he has been President of the Commission since 1920. He was the author of the plan under which eight municipalities in northern New Jersey jointly constructed an outlet sanitary sewer system, and was first chairman of the commission which placed the plan in operation. He has served as president of the Board of Education of South Orange, trustee of that village and its president for seven years.



ROBERT S. SINCLAIR

# and Tunnel Commission



JOHN B. KATES  
*Vice-Chairman*

Prominent in public life for many years, Mr. Kates was Judge of the County Court of Camden County from 1917 to 1922, when he became a member of the New Jersey Interstate Bridge and Tunnel Commission. In 1912 he served as Clerk to the Judiciary Committee of the House of Assembly and was a member of the House from 1913 to 1916, being Minority Leader in 1913. He was elected State Senator in 1916. He is also a director of a number of building and loan associations of Camden County, and is president of the Broadway Trust Company of Camden and director of the Collingswood National Bank.



FRANK L. SUPLEE

Council from 1906 to 1909. He was Township Clerk of Pittsgrove, N. J., from 1895 to 1901 and a member of the Board of Education from 1902 to 1905. From 1921 to 1924, he was a member of the Board of Education of Glassboro, N. J., where he now resides.

Interested in bridge and tunnel construction enterprises for many years, Mr. Barlow has served with the New Jersey Interstate Bridge and Tunnel Commission since 1918. He was superintendent of The Howard D. Thomas & Company, woolen manufacturers, for seven years. For twenty-five years, he was in the merchant tailoring business in New Jersey, and has been active in real estate in Maple Shade, New Jersey, where he was chairman of the Township Committee for a three-year term.



THOMAS J. S. BARLOW



ISAAC FERRIS

Appointed to the New Jersey Interstate Bridge and Tunnel Commission in 1922, Mr. Ferris was one of its most active members during the trying period of the Holland Tunnel's construction. He is vice-president of the Camden National Bank and Trust Company, director of the Security Trust Company of the same city and director of the Independence Fire and Security Company of Philadelphia. In addition to his activity with the tunnel, Mr. Ferris has devoted many years of his life to public service.

Mr. Suplee has served as a member of the New Jersey Interstate Bridge and Tunnel Commission since 1922. Prior to his appointment to the commission, he was a member of the Glassboro, N. J., Borough Council from 1920 to 1921 and the Elmer, N. J., Borough

# The Engineers Who Built the Holland Tunnel



*Milton H. Freeman, Second Chief Engineer, whose uncanny ability to guide a shield contributed materially to the successful construction of the Holland Tunnel.*



*Clifford Milburn Holland, genius of the Holland Tunnel and its First Chief Engineer, in whose memory the tunnel was named. He took office on July 1st, 1919, and died, a victim of his own zeal, on October 27th, 1924.*



*Ole Singstad, Third Chief Engineer of the tunnel, under whose direction the twin tubes were completed, and the operation of the tunnel actually started. The ventilation plan and the program for the research work in connection with it were developed under his direction.*

A TRIUMVIRATE of engineers built the Holland Tunnel. Two gave their lives to it. Only one was spared to witness and participate in the triumphs of opening day. Clifford M. Holland envisioned the tunnel and planned its construction. Upon his death Milton H. Freeman, who had been Engineer of Construction, took up the burden of Chief Engineer and carried on for five months, when overwork exacted the supreme price from him, too. He was succeeded by Mr. Ole Singstad, who had been Engineer of Designs from the time the engineering staff was organized. Under his direction the Holland Tunnel was completed.

THAT this engineering achievement cost the lives of its first two Chief Engineers—not from accident, but from a drain on their vital energy—is perhaps the most striking evidence of the magnitude of the undertaking. Other tunnels under the Hudson will be built, other problems in successful ventilation will be solved, but for many years to come the Holland Tunnel will remain one of the modern wonders of the world.

# The Story of the Holland Tunnel

THE real story of the Holland Tunnel dates back twenty-one years to the Spring of 1906 when the States of New Jersey and New York created joint commissions to investigate the feasibility of constructing a bridge over the Hudson River uniting New York City with Jersey City. The men appointed to these commissions faced a discouraging task, for the actual need of supplying some means of transportation to supplement the ferries plying between those two ports was not sufficiently recognized at the time to give their pioneer work the public support which it deserved. It is conceded today however that the successful completion of this great engineering conception was due to the faith, courage and persistence of the two small groups of successful and prominent business men of New York and New Jersey who, after the first public proposal of a "fixed crossing" of the Hudson River, had to struggle for thirteen years before the public mind was aroused sufficiently to support construction appropriations in the legislatures of the two states.

General George R. Dyer, Chairman of the New York State Bridge and Tunnel Commission and his colleagues, E. W. Bloomingdale, Vice-Chairman, Alexander J. Shamberg and McDougall Hawkes have the unprecedented distinction of having served the State continuously in connection with this single project for over twenty years without remuneration and for the major part of that time without even encouragement.

The personnel of the New Jersey Commission has changed from time to time but its present organization consisting of Theodore Boettger, Chairman; John B. Kates, Vice-

Chairman; John F. Boyle, Weller H. Noyes, Robert S. Sinclair, Thomas J. S. Barlow, Isaac Ferris and Frank L. Suplee served on the Commission during practically the entire period of construction. All of these men had the satisfaction of seeing their faith in this great engineering undertaking vindicated when the tunnel was opened to traffic. Incidentally, a factor that contributed materially to the success of the project was the harmonious relationship that existed between the New York and New Jersey Commissions during the construction period. There was never any friction between them.

It should be stated here that the original idea of building a bridge between New Jersey and New York was supplanted by the tunnel project in 1913 following careful investigations by both commissions, which indicated that owing to the topographical conditions, the cost of a bridge in the location where the "fixed crossing" was most needed, would be almost prohibitive as compared to the cost of a tunnel. The tunnel also had additional advantages which a bridge would not possess, for it would be unaffected by climatic or other interference. The commissioners also foresaw that by building a vehicular tunnel they would increase the facilities for commerce in the port of New York by removing from the surface of the harbor many lighters and other floating equipment used in the transportation of freight from the Jersey City railroad yards to New York and Long Island destinations.

They foresaw, too, that it would furnish the means for the uninterrupted movement of troops and supplies to and from the City of New York in case of need.

*(Continued on page 9)*



*This photograph shows the eastbound tunnel approaching Manhattan. Passenger cars and commercial vehicles keep in separate lines.*



*The "straightaway" from the New York-New Jersey boundary line, looking toward Jersey City. This picture shows clearly the ventilation slits in the sides of the roadway and the exhaust ports in the ceiling.*

Actual authority to build the tunnel was given to the commissions on April 10th, 1919. The important duty then confronted them of selecting a Chief Engineer. It was realized from the beginning by these laymen that the work was of an unprecedented character and would require the most expert engineering direction.

After looking the field over, the commissions selected as Chief Engineer, Mr. Clifford M. Holland, tunnel engineer of the Public Service Commission, 1st District, State of New York, in immediate charge of the construction of all subway tunnels under the East River. He was regarded as having had a greater and more successful experience in the work of subaqueous tunnel construction than any other member of his profession.

A board of Consulting Engineers was appointed and a contract or treaty between the two States was drawn up and approved by the commissions and given the consent of Congress.

Chief Engineer Holland took office on July 1st, 1919, and at once began the organization of an engineering staff. His chief assistants were selected from those who had been associated with him in the construction of the East River subway tunnels. Having had not less than ten years experience in subaqueous tunneling they were well qualified both by technical training and by practical experience to meet the requirements of the work. Actual construction began October 12th, 1920.

Mr. Holland died on October 19th, 1924, after giving five of the best years of his life to the project—a victim of his own untiring energy and devotion to the task which had been committed to him, and of his own zeal of accomplishment. Under his direction all the more difficult portions of the work had

been completed and the remaining details planned, and just two days after his death there came a demonstration of his engineering skill and accuracy in the successful junction of the under river headings of the North Tunnel. The commissions perpetuated Holland's fame by naming the tunnel after him.

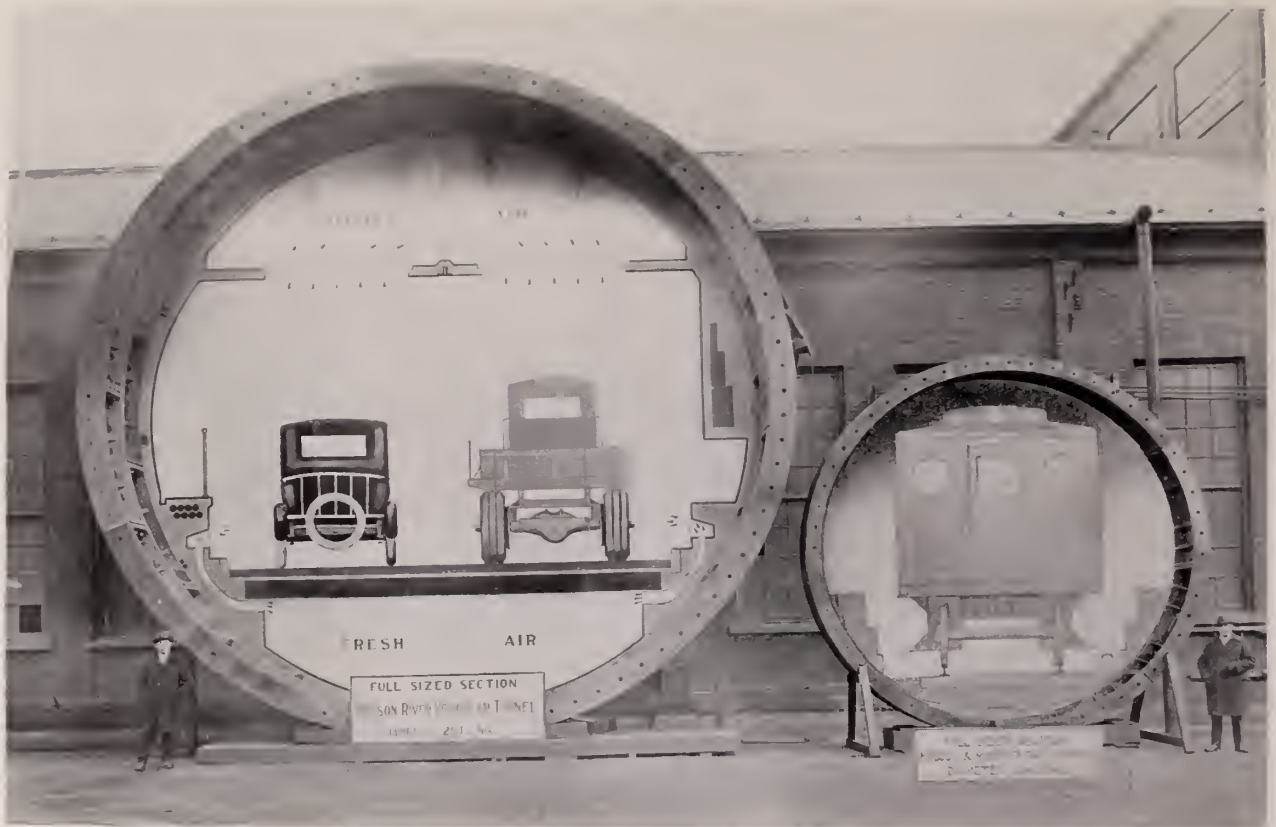
Mr. Holland was followed by Mr. Milton H. Freeman, who had been his first assistant in charge of construction work. Mr. Freeman, too, gave himself unsparingly to the work and died on March 24th, 1925. As a tribute to his share in the undertaking, the plaza at Manhattan's entrance to the tubes has been renamed "Freeman Square."

Mr. Ole Singstad, who was Mr. Holland's Engineer of Design, succeeded Mr. Freeman in 1925 and carried the work of construction to successful completion.

The care and thoroughness with which the commissions prepared for the operation of the tunnel was attested by the smoothness and precision with which over 51,000 cars were safely and quickly transported through the tunnel on the very first day of operation. This great load placed upon the operating staff on the very first day of operation, and successfully carried without a single untoward incident, is considered a complete proof of the excellence of the plan of the operating organization which was prepared by former New York State Engineer and Surveyor Frank M. Williams, at one time an ex-officio member of the New York Commission and now acting as its consulting engineer.

Although there are other vehicular tunnels in the world, the Holland Tunnel dwarfs all of its predecessors and commands the admiration of engineers, because the construction of its twin tubes presented new problems.

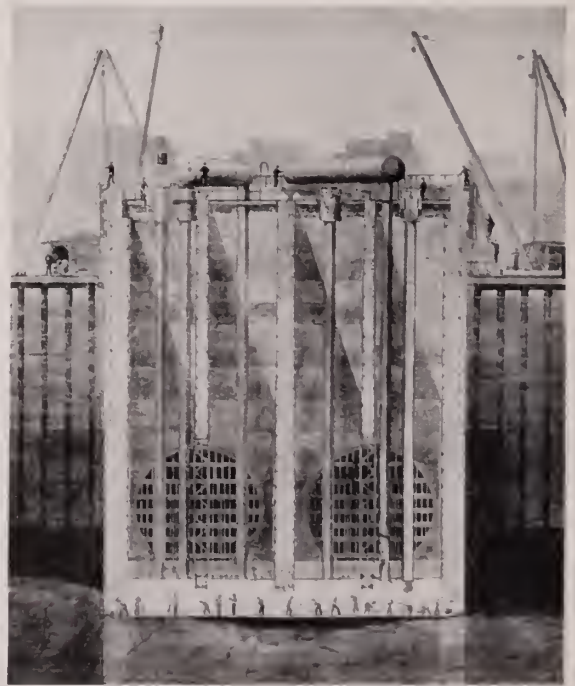
London has its Blackwall and Rotherhithe tunnels, Glasgow its three-tube Harbor tun-



*A comparison of actual sections of the Holland Tunnel and the Hudson and Manhattan Tunnel. The vehicular tunnel is almost twice the size of the tube that was built solely for train traffic.*



*Tightening the bolts in a tunnel segment.*



*One of the giant caissons used on the New York side.*

nel and Hamburg its twin-tube Elbe Tunnel, but none of these are as long as the Holland Tunnel, and in none were the engineers concerned with an endless stream of engines discharging smoke and, worse still, carbon monoxide—one of the deadliest gases known. The scientific resources of the Universities of Yale and Illinois and of the United States Bureau of Mines were drawn upon to make the Holland Tunnel as safe, from the standpoint of ventilation, as any open-air city boulevard.

In the distributive method of ventilation adopted for the Holland Tunnel, the air is introduced into and exhausted from the tunnel through a number of openings at frequent intervals leading from the tunnel roadway. By this method fresh air is supplied at all points throughout the tunnel. The air at any point can be controlled. There is no discomfort or danger from high velocity air currents. Ventilation is not affected by traffic or the direction of the wind. Exhaust gases are quickly diluted and removed.

The space above and below the tunnel roadway is ideally suitable for air ducts. Fresh air supplied by blower fans at the shafts in the Land buildings is discharged from the main duct under the roadway through adjustable openings in the continuous expansion chambers on each side, thence through a continuous slot into the roadway. Almost four million cubic feet of fresh air is pumped into the tunnel every minute by this system. The air remains in the tunnel an average of one and one-half minutes, as it slowly ascends to the ceiling.

Exhaust fans located in the same buildings with the blower fans draw the vitiated air through ports in the ceiling and thence

through the upper duct above the roadway, delivering it through stacks to the outer atmosphere.

The average motorist who uses the tunnel for the first time is impressed by three things. First, the freshness of the air; Second, the daylight effect produced by the lighting system, and Third, the lack of oppression which one normally feels even upon using the subway for the first time.

When a motor car driver enters either of the tubes he sees before him a seemingly endless and brightly illuminated cavern. One side is a raised sidewalk intended primarily for the traffic police. At the right is a continuous train of heavy motor trucks. At the left a stream of passenger automobiles. In the walls, near the sidewalk are niches. Traffic policemen stand in them. Overhead are the usual signal lights—red and green. There is also a third light, quite new to him. It is not illuminated, but he can just make out the outlines, "Stop Engine." This signal is used whenever traffic is blocked for more than a minute or two, so that the fumes from the exhaust pipes do not unnecessarily increase the amount of carbon monoxide in the air. The tubes are 9,250 feet long—a mile and three quarters—and the average time it takes to sped through them is between five and six minutes.

It is believed that every possible accident from the human element has been foreseen and provided against. Two hundred and ten policemen have been trained and organized for tunnel traffic and fire-fighting duty. All of these men are expert mechanics as well as policemen and firemen and are trained to help out a nervous driver whenever his engine stalls or perform minor emergency repairs whenever necessary.

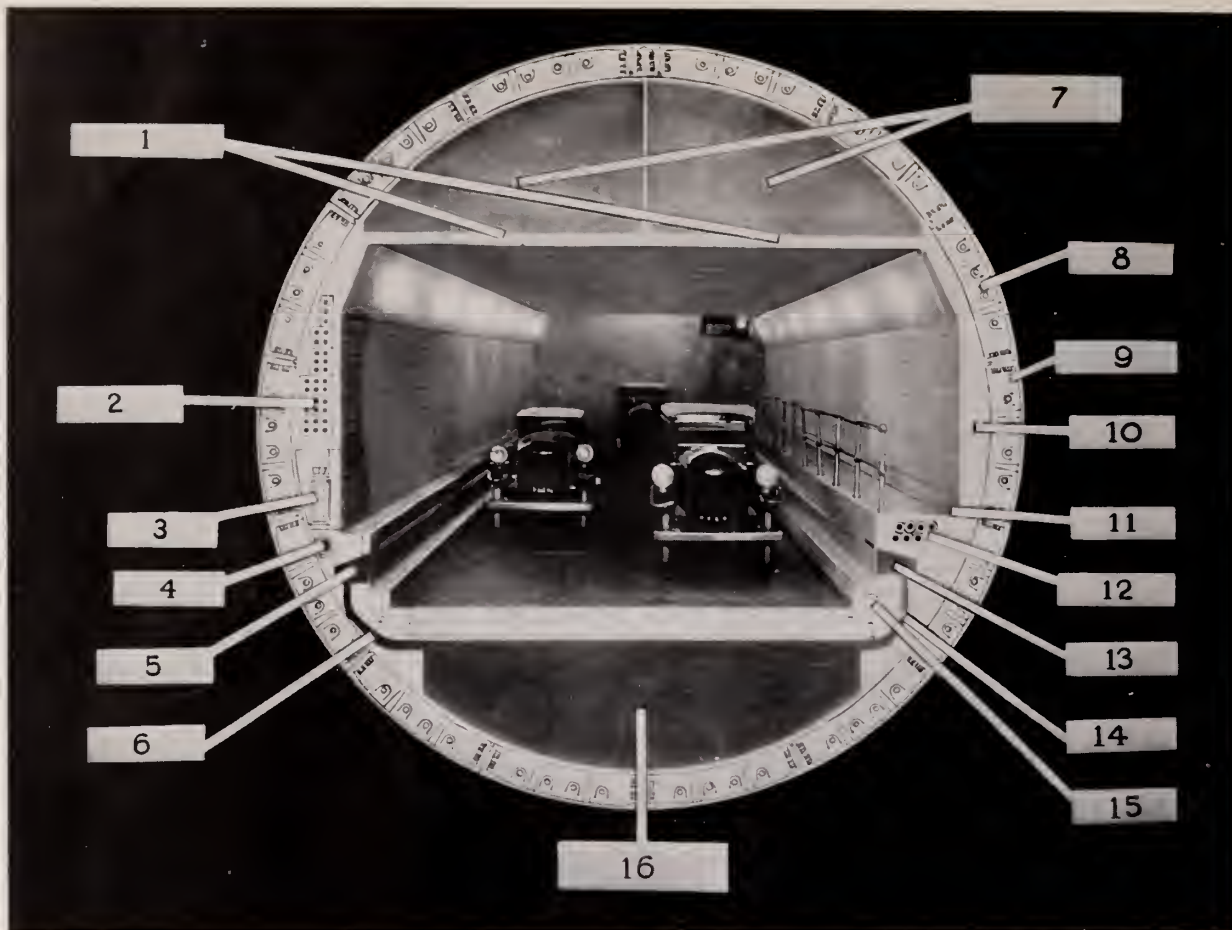


PHOTO BY WESTINGHOUSE LAMP CO.

## The Holland Tunnel

ONE OF THE TWIN TUBES

1. Exhaust air ports every 15 feet throughout.
2. Telephone and telegraph cables.
3. Fire extinguisher.
4. Water supply pipe.
5. Continuous duct for fresh air supply to roadway.
6. Fresh air flues every 15 feet throughout.
7. Exhaust-air duct running through the entire length of the tunnel.
8. Tunnel segment, weight 3,000 lbs.
9. Weight of complete ring 21.6 tons.
10. Concrete.
11. Sidewalk.
12. Power cables for operation of tunnel.
13. Fresh-air expansion chamber.
14. Fresh-air flues every 15 feet throughout.
15. Drain.
16. Fresh-air duct running through the entire length of the tunnel.

*This photograph was made from the model built to study illuminating systems.*

## Work Under Compressed Air

The driving of the tunnels by means of shields underneath the bed of the Hudson River and the sinking of the seven shafts and thirty caissons for building foundations were accomplished by means of compressed air which balanced the pressures on the outside of these structures and held the river water out, which otherwise would have seeped down through the river mud or silt and penetrated the working chambers of the shaft caissons and the tunnel headings. While the greater part of the under river tubes were driven through silt, a stretch of nearly 1,000 feet near the New York pierhead line was driven through ledge rock. It is in this rock that the pump chamber and sump for collecting any water that might flow in the tunnel roadway, are located, at the lowest point. Four of the principal contracts covered this part of the construction, which proceeded almost continuously from June 27, 1921, to the date of the discontinuance of the use of compressed air, May 8, 1926. The maximum pressure required was for the New Jersey river shafts and was  $47\frac{1}{2}$  pounds per square inch above atmosphere.

During this five-year period 756,565 decompressions took place, of men coming out of the compressed air work, and the care taken in spending the full times for decompressions accounts for the low number of cases of "bends," or caisson disease, which totalled but 528, or a percentage of less than  $\frac{7}{100}$  of one percent, no fatality having occurred which was directly attributable to caisson disease.

## Power Supply

The electric current for operating the ventilation equipment and lighting of the tunnel is obtained from both sides of the Hudson River.

On each side current is available from three independent cables any one of which can be fed from either of two generating sources, making a total of four independent generating sources served by six independent cables. Each cable is of sufficient capacity to carry the full tunnel load, thereby providing adequate insurance against power failure.

## Supervisory Control

In addition to a subsidiary control board in each of the four ventilation buildings, from which all equipment in that building can be operated, there is a central supervisory control board located in the top floor of the New York Administration Building from which board all equipment in the entire tunnel project can likewise be operated by the Chief Operator.

## Tunnel Lighting

The lights in the tunnels' sidewalls are normally placed about 20 feet apart along the tunnel. At the portals and for a short distance within, this spacing is reduced in order to provide greater illumination at these points to counteract the sudden transition from daylight into the artificial lighting of the tunnel. The two main sources of power serve alternate lights, so that the failure of one source of power would still leave half of the lights illuminating the roadway.



*Caulking the tunnel to keep water from seeping in.*



*The New York River Building—one of the four buildings which house the ventilating fans.*



*Holing through! Two brothers were foremen of the rival gangs of "sandbogs" at the joining of the under-river headings.*

## Construction Contracts

THE Commissions were fortunate in obtaining for the construction and equipment of the tunnel, contractors of the highest grade and responsibility. These men not only supplied the material and equipment, but also took a personal interest and pride in carrying out the particular portion of the work entrusted to them. Some of these contracts involved great financial risk, as a great deal of this work was pioneer in character.

Ground was broken for the first contract, the New York land shafts, on October 12, 1920, since which date there have been twenty-two construction and equipment contracts let and brought to completion by the Commissions. The embellishment of the entrances and exits, including the lining of the present concrete walls with granite masonry, will be cared for by two contracts still to be let, preparation of which is now in progress.

The principal contractors who helped to build and equip the Holland Tunnel include the following:

Booth & Flinn, Ltd.  
*Tube Construction N. Y. and N. J.  
and Approach Construction, N. J.*

Rodgers & Hagerty, Inc.  
*Approach Construction, New York.*

De Riso Construction Co.  
*Construction of Ventilation Bldgs.*

L. Del Turco & Bros., Inc.  
*Tunnel Tile and Finish.*

Fischbach & Moore, Inc.  
*Electrical Installation.*

Holbrook, Cabot & Rollins Corp.  
*Spring St. and Canal St. Shafts.*

Leonard Paving Co., Inc.  
*Plaza Paving, New Jersey.*

B. F. Sturtevant Co.  
*Fans, Motors and Transmission.*

The Carleton Co., Inc.  
*Administration Bldgs. and Toll Collection Booths.*

William J. Fitzgerald  
*Tunnel Pavement.*

General Electric Co.  
*Furnishing Transformers and Oil Switches.*

John Meehan & Son  
*Plaza Pavement, New York.*

Standard Underground Cable Co.  
*Tunnel Power Cables.*

Commercial Truck Co.  
*Emergency Equipment.*

Foamite-Childs Corp.  
*Fire Extinguishing Equipment.*

Most of the electrical equipment was furnished  
by Westinghouse Electric and Manufacturing Co.

# Tolls and Regulations

## TOLLS

The following toll rates shall apply to and be collected for vehicles, as designated:

Vehicle Type	Group No.	Rate
Motorcycle .....	I	\$0.25
Passenger Automobile, with a capacity up to 7 passengers, ambulance or hearse .....	II	0.50
Bus up to and including 29 passenger seating capacity .....	III	1.00
Truck up to 2 tons .....	IV	0.50
2 Ton+to 5 Ton Truck .....	V	0.75
5 Ton+to 10 Ton Truck .....	VI	1.00
Trucks exceeding 10 Tons capacity and not exceeding 15 Tons Gross Weight nor exceeding 12 Tons Axle Load .....	VII	2.00
Vehicles admitted under Special Permit .....	VIII	Special*
Bus exceeding 29 passenger seating capacity but not exceeding dimensions elsewhere prescribed .....	IX	1.50

Prepaid Tickets for any of the above classifications may be purchased in books of fifty at the Executive Offices on the third floor of the New York Administration Building, Canal & Varick Streets, New York City, for cash or certified check, payable to the order of The New York State Bridge & Tunnel Commission or The New Jersey Interstate Bridge & Tunnel Commission.

Toll Rates are based on the truck's carrying capacity. Trucks loaded beyond rated capacity shall pay according to actual load carried.

Vehicle Weight, Carrying Capacity and Gross Weight must be displayed prominently on all trucks as required by law.

\* TOLL RATES for vehicles under special permit as follows:

Survey charge \$10 and, in addition, thereto, for permit if issued, the toll rated in the table of tolls, plus 25 cents for each additional ton or fractional part thereof, in excess of 15 tons; 10 cents for each three inches or fractional part thereof of side overhang exceeding the 9-inch limit; 10 cents for each three inches or fractional part thereof of width exceeding 8 feet or of height exceeding 12 feet; 10 cents for each three feet or fractional part thereof exceeding the length limits prescribed elsewhere in these regulations.

Survey charges may be waived in special cases.

Applications for special permits involving surveys must be made a reasonable time in advance.

Trailers will be charged for as separate vehicles on a basis of their carrying capacity. Tractors or semi-trailers will be charged in addition a rate based on one-half the capacity of the trailer.

SPEED IN THE TUNNEL IS NOT TO EXCEED 30 MILES PER HOUR.

SPACING—VEHICLES MOVING OR STANDING IN THE TUNNEL SHALL MAINTAIN A CLEAR SPACING OF NOT LESS THAN 75 FEET.

SPECIAL PERMITS—Special permits obtainable from the superintendent's office, will be required to admit vehicles falling under the following classifications:

Vehicles exceeding 15 tons gross weight, those having a side overhang beyond the rim of the wheel exceeding 9 inches, those wider than 8 feet or longer than 30 feet, or exceeding 12 feet in height, all inclusive of load, two-wheel semi-trailers exceeding 38 feet over all, including tractor, four-wheel trailers exceeding 46 feet over all, including tractor and such slow-moving vehicles as floats, steamrollers, steam shovels, movable cranes, etc.

VEHICLES, ETC., EXCLUDED—Bicycles, hand and push carts, wheelbarrows, double-deck buses, horse-drawn vehicles, vehicles having axle loads in excess of 12 TONS or wheel loads exceeding 800 pounds per linear inch width of tire, metal-tired vehicles, motor vehicles that are smoking. No bus will be admitted to the tunnel unless all passengers are seated on seats permanently affixed to the bus. For the present, pedestrians will not be admitted to the tunnel.

COMMODITIES EXCLUDED—Articles or commodities falling under the following classifications, as listed and defined in the regulations of the United States Interstate Commerce Commission covering the transportation of explosives and other dangerous articles, shall be excluded from the Tunnel.

1. Explosives.
2. Dangerous articles other than explosives, as follows:
  - (a) Inflammable liquids (those giving off inflammable vapors at ordinary temperatures).
  - (b) Corrosive liquids (including the well-known powerful mineral acids).
  - (c) Compressed gases of a poisonous nature.
  - (d) Poison gases or liquids (those gases which are highly poisonous when present in the air even in small proportions and those liquids which give off highly poisonous vapors at ordinary temperatures).

Loose hay, straw or other material in like condition which is ordinarily combustible will not be admitted; nor reserve gasoline exceeding 1 gallon.

## REGULATIONS FOR DRIVERS AND OWNERS OF VEHICLES

(1) No operator who is physically incapable of operating his vehicle will be permitted to enter the tunnel.

(2) No vehicle which is so loaded or constructed as to seriously retard traffic or injure persons or damage property will be permitted to enter the tunnel. Baled hay, or straw or other inflammable material must be covered with tarpaulin. In special cases, however, admission may be obtained through special permit by the superintendent.

(3) No tire changes may be made in the tunnel.

(4) Smoking in the tunnel is prohibited.

(5) NO VEHICLE MAY LEAVE ITS LINE EXCEPT AS SO DIRECTED BY A POLICEMAN.

Drivers' attention is called to signs posted at New York City exit at Canal Street also to City police regulation of traffic at this point.

(6) The use of cut-outs, horns, sirens, whistles and any other noise-making device in the tunnel is prohibited.

(7) All vehicle head lights must be extinguished upon entering the tunnel.

(8) SIGNAL LIGHTS—GREEN SIGNAL LIGHT indicates that traffic lanes are clear and that traffic may proceed. RED SIGNAL LIGHT indicates that traffic must halt. Engines will not be permitted to race at a halt. "STOP ENGINE" SIGNAL indicates that ALL ENGINES MUST BE STOPPED AT ONCE and shall remain so until the green light is again displayed for resumption of travel. YELLOW SIGNAL LIGHTS indicate that all traffic shall move in right hand lane only.

(9) Broken Down Vehicles, etc.

(a) Gasoline will be supplied to a car running out of gasoline in the tunnel at \$1.00 per gallon. This will be payable to the officer upon delivering the gasoline.

(b) Cars breaking down in the tunnel and requiring the use of the tunnel emergency towing equipment will be towed out into the exit plaza. The charge for such services, double the regular toll rate, is payable to the sergeant in charge of emergency truck.

(10) Any person who through gross carelessness, recklessness or without due regard for the safety of persons or property, violates the traffic rules of the Commissions or endangers the safety of persons or property, shall be reported by the Department of Police to the Superintendent. Thereafter a notice shall be served upon such violator that at a specified time and place a hearing will be held, at which he is invited to attend and show cause why he should not be barred from using the tunnel for a period to be designated by the Commissions. Such hearing shall be held before the Superintendent or a member of his staff designated by him, and a report of his findings and recommendations shall be transmitted to the Commissions.

# The Holland Tunnel Executives

## NEW YORK STATE BRIDGE AND TUNNEL COMMISSION

George R. Dyer, *Chairman*  
 E. W. Bloomingdale, *Vice-Chairman*  
 McDougall Hawkes  
 A. J. Shamberg  
 Albert Goldman, *Commissioner of Plant and  
Structures of New York City*  
 Frederick S. Greene, *Superintendent of Public  
Works*  
 Paul Windels, *Commsel*  
 Morris M. Frohlich, *Secretary*

## NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION

Theodore Boettger, *Chairman*  
 John B. Kates, *Vice-Chairman*  
 Thomas J. S. Barlow  
 John F. Boyle  
 Isaac Ferris  
 Weller H. Noyes  
 Robert S. Sinclair  
 Frank L. Suplee  
 Robert Carey, *Commsel*  
 E. Morgan Barradale, *Secretary*

## Chief Engineers

Clifford M. Holland\*

Milton H. Freeman\*

Ole Singstad

## CONSULTANTS

John A. Bensel\*  
 George H. Brown  
 William H. Burr  
 Edward A. Byrne  
 J. Vipond Davies  
 Henry W. Hodge\*  
 Sullivan W. Jones  
 Dr. Edward Levy  
 George L. Lucas  
 Frederick C. Noble  
 Lewis B. Stillwell  
 George L. Watson  
 William J. Wilgus  
 Arthur C. Willard  
 Frank M. Williams

\* Deceased

## ENGINEERING ASSISTANTS

Orrin L. Brodie  
 Charles L. Crandall  
 Arthur C. Davis  
 John N. Dodd  
 James H. Dugan  
 Leo Geenens  
 Charles S. Gleim  
 Joseph C. Imhoff  
 Aksel H. Jorgensen  
 Miles I. Killmer  
 Howard L. King  
 Jacob Mechanic  
 Charles W. Murdock  
 Erling Owre  
 Ralph Smillie  
 Jesse B. Snow  
 Frederic A. Snyder  
 Eberhard Welle

CHIEF AUDITOR	-	-	-	-	-	-	-	-	-	-	-	-	Moses Markowitz
CAPTAIN OF TOLLS	-	-	-	-	-	-	-	-	-	-	-	-	William A. Halligan
ACTING CHIEF OF POLICE	-	-	-	-	-	-	-	-	-	-	-	-	Cornelius F. Cahalane

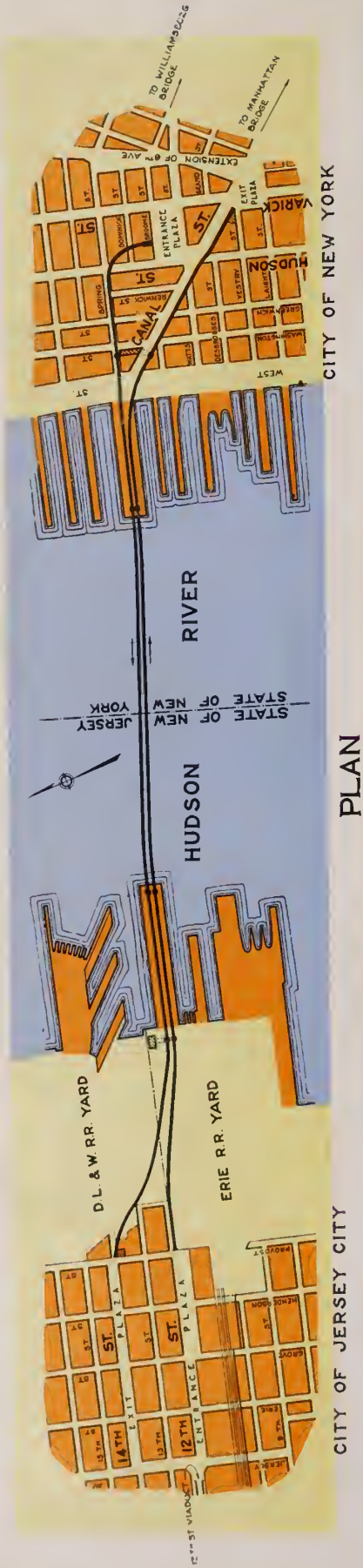
## BUREAU OF INFORMATION

Director	-	-	-	-	-	-	-	-	-	-	-	-	Charles T. Heaslip
Assistant Director	-	-	-	-	-	-	-	-	-	-	-	-	Edward F. Darrell, Jr.

## EXECUTIVE HEADQUARTERS

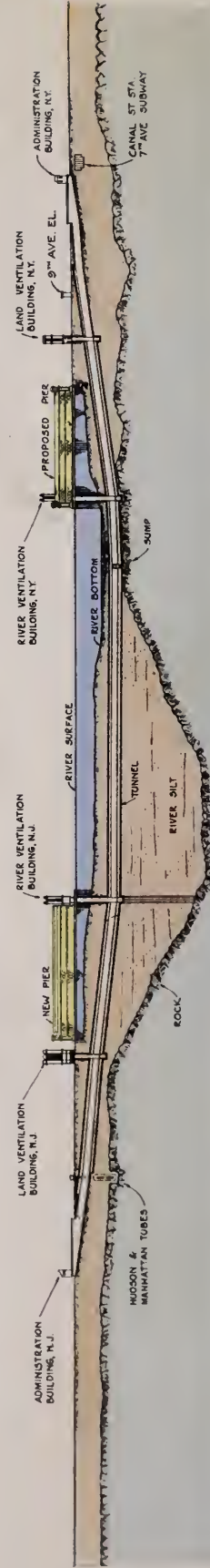
Holland Tunnel Administration Building, Canal and Varick Streets, New York City

# THE HOLLAND TUNNEL



PLAN

Plan of tunnel showing New York and Jersey City plaza entrances and exists, main traffic lanes in vicinity of tunnel mouths and dividing line between the two states.



PROFILE

Profile of tunnel showing principal buildings, depth of tunnel below river's surface and bed and proposed piers.

Maximum depth, top of tunnel below mean high water 72 feet  
Maximum depth of roadway below mean high water 93 feet